Date: January 25, 2013

To: Diana Marquez

From: Shauna Lawrence

Re: QA/QC Review of Analytical Data
Phase I of the Direct Push Sampling – September 2012
Quality Analytical Services (QAS), Blue Summit, MO
Project No. 62589

Groundwater samples were collected during Phase I of the Direct Push Sampling activities at the Quality Analytical Services (QAS) location at 1633 Marsh Avenue, Blue Summit, Missouri (Site). Field activities and sample collection were conducted September 13 through September 15, 2012. All samples were submitted to TestAmerica of Phoenix, Arizona (TestAmerica) for 1,4-dioxane analysis by SW-846 8270C Mod.

The quality assurance/quality control (QA/QC) results in association with the samples collected were examined for any method-specific requirements. Data qualifiers, when appropriate, were added to the data as recommended in *National Functional Guidelines for Superfund Organic Methods Data Review* (NFGO, 2008). The following data sets are included as part of this QA/QC review:

Phase 1 - Sampling event (September 13 through September 15, 2012	
PVI1016 (lab #s 01-02) – sampled 11/14/2012	PVI1187 (lab #s 01-03) – sampled 9/15/2012
PVI1017 (lab #s 01-04) – sampled 9/14/2012	PVI0934 (lab #s 01-04) – sampled 9/13/2012
PVI1186 (lab #s 01-04) – sampled 9/15/2012	

Table 1 presents the data qualifiers added during the course of this review. The QA/QC review results are discussed below.

1. Chain-of-Custody – The chain-of-custody (COC) forms were reviewed for any errors or omissions. All relinquished and received signatures, times, and dates on the COC forms were properly signed. The following discrepancies were noted, but did not impact the data, and no further actions were necessary.

    - The lab added the "MS/MSD" sample identification to DP-128W02/34-38 (PVI1016-02). This sample was also used for QC spiking purposes which was indicated by the "MS/MSD" extension on the COC.

    - The sample depth for TP-126W02/36.7-46.7 (PVI1186-04) was logged-in by the lab as 467. All further references to this sample point are correctly noted as 46.7.

2. Requested Analyses Completed – All analyses were completed as requested.

3. Holding Times Met – All extractions and analyses were performed within their method-required holding times.

4. Sample Preservation Acceptable – Some samples were received within or slightly below the recommended sample preservation temperature of 4 degrees Celsius (°C) ± 2 °C. None of the samples received below the recommended temperature range were received in a frozen state. Upon check-in, all samples were placed in

the laboratory coolers and kept within the recommended range. Overall, impact to the samples was negligible.

5. Method Requirements – The lab added the following data flag to one or more 1,4-dioxane results in the analytical data sets. These were lab flags based on the reporting of the results. Data qualifiers added based on these data flags are noted below:

    - N1 – This flag was applied to three samples to note the 1,4-dioxane concentration exceeded the calibration range, and is semi-quantitative. The analysis is an isotope dilution; it can only be diluted to the point of the extraction step, and not any further in the process. Due to insufficient sample volumes, no additional diluted analyses could be prepared for the noted samples. As such, the 1,4-dioxane results for the three affected samples should be considered estimated (J*). This includes the following samples: DP-126W01/26-30 (PVI0934-01RE1), DP-126W01A/26-30 (PVI0934-02), TP-126W02/36.7-46.7 (PVI1186-04).

    - It is important to note, that the results for Phase I of the direct-push samples results were reported to the practical quantitation limit (PQL) rather than to the method detection limit (MDL). It was during sample analysis for the Phase II activities that the request was made for the samples to be reported to the MDL. No qualifiers were necessary for this.

6. Laboratory Method Blanks – No detections of 1,4-dioxane were noted in the laboratory method blanks.

7. Rinsate Blank – No detections of 1,4-dioxane were noted in rinsate blank DP-126/W03ERB/46-50 (PVI0934-04).

8. Surrogates – Surrogates are added for organic analyses. Surrogates are compounds not normally found in the environment that are added (spiked) into samples and analyzed for the percent recovery (REC).

    All surrogate results were within their respective control limits.

9. Laboratory Control Sample (LCS)/Laboratory Control Sample Duplicate (LCSD) – The LCS contains a matrix similar to that of the sample that has been spiked with known concentrations of target analytes. The LCS is prepared and analyzed by the same method as the samples. As a measure of analytical accuracy, the results of the LCS are compared against the known analyte concentrations in the spike to determine REC. The purpose of the LCS is to determine the performance of the laboratory with respect to analyte recovery, independent of field sample matrix interference. The laboratory also reported a LCSD. The relative percent difference (RPD) between the LCS/LCSD RECs was calculated to determine analytical precision.

    All LCS/LCSD RECs and RPDs were within QC limits.

10. Matrix Spike/Matrix Spike Duplicate – MS/MSDs are run for organic and inorganic analyses. A sample is split into three portions (original, MS, and MSD), and a known amount of an analyte is added (spiked) to two portions (MS and MSD) of the sample. The results of these two portions are compared with each other for reproducibility using the RPD. They are also compared against the unspiked portion for REC of the spike. Typically, only site-specific MS/MSDs are covered in the QA/QC data review unless re-occurring problems are noted across several analytical batches.

One site-specific MS/MSD was performed on project sample DP-128W02/34-38 (PVI1016-02) for QC Batch 12I0825. All MS/MSD RECs and RPDs for this project sample were within control limits:

For those QC batches which did not have sufficient sample volume for project-specific MS/MSDs, precision and accuracy were assessed by review of the associated surrogate and LCS/LCSD results. No qualifiers were added to samples in these QC batches based on these MS/MSD omissions.

11. Field Duplicate Results – Field duplicate results provide information on the ability to reproduce field results and account for error introduced from handling, shipping, storage, preparation, and analysis of field samples. There are no specific USEPA criteria for qualifying data from field duplicate results. Depending upon the sample concentration, one of the following criteria based upon the *National Functional Guidelines for Inorganic Superfund Data Review* (NFGI, 2010) is applicable:

    - Is the compound detected in both portions?
    - If the sample concentrations are greater than 5 times the detection limit, then the maximum allowable RPD is 20 percent for water samples.
    - If the sample concentrations are less than 5 times the detection limit, then a sensitivity test is applied. For the sensitivity test, the sample concentrations must agree within ± the lower detection limit for water samples.

    The following field duplicate pairs were collected and reviewed. Side-by-side results for these field duplicate pairs are presented on Table 2:

    - DP-126W01/26-30 (PVI0934-01RE1) and DP-126W01A/26-30 (PVI0934-02): All OK
    - DP-128W03/44-48 (PVI1017-02) and DP-128W03A/44-48 (PVI1017-01): All OK

12. Reporting Limits – Most samples had a low dilution factor variation due to the sample volume utilized for the sample extraction/preparation. These were all less than two. Any data flags added based on the sample volume were noted in Section 5.

13. Conclusion – The data were reviewed for achievement of any method-specified QA/QC criteria. Table 1 presents the data qualifiers added during this QA/QC review, and Table 2 presents the field duplicate results. No data were rejected (R) during the course of this review. The data are valid for use, as qualified, in reporting the results of this Phase I Direct Push Sampling Event.

    Attachments (See Below)

    Tables
    Table 1 – Data Qualifiers – Phase I
    Table 2 – Field Duplicate Results – Phase I

Table 1
Data Qualifiers (Phase I)
Quality Analytical Services (QAS), Blue Summit, MO

Sample Identification	Laboratory Number	Analyte	Data Review Qualifier	Reason for Qualification
DP-126W01/26-30	PVI0934-01RE1	1,4-Dioxane	J*	Sample concentration exceeded calibration range of the instrument.
DP-126W01A/26-30	PVI0934-02	1,4-Dioxane	J*	Sample concentration exceeded calibration range of the instrument.
TP-126W02/36.7-46.7	PVI1186-04	1,4-Dioxane	J*	Sample concentration exceeded calibration range of the instrument.

Notes:
J* = Qualified as estimated during QC review

Table 2
Field Duplicate Results (Phase I)
Quality Analytical Services (QAS), Blue Summit, MO

Sample Identification:		DP-126W01/26-30	DP-126W01A/26-30	Meets QC Criteria?
Laboratory Number:		PVI0934-01RE1	PVI0934-02	
Date Sampled:		09/13/2012	09/13/2012	
Analyte	**Units**			
1,4-Dioxane	ug/L	560 J*	630 J*	Yes

Sample Identification:		DP-128W03/44-48	DP-128W03A/44-48	Meets QC Criteria?
Laboratory Number:		PVK1017-02	PVK1017-01	
Date Sampled:		11/14/2012	11/14/2012	
Analyte	**Units**			
1,4-Dioxane	ug/L	32.0	32.0	Yes

Notes:
J* = Qualified as estimated during QC review
QC = Quality Control
ug/L = micrograms per liter